

WORCESTER POLYTECHNIC INSTITUTE

MECHANICAL ENGINEERING DEPARTMENT

HOMEWORK – CHAPTER 08

COURSE No.: ME-593N, Fall 2000
COURSE NAME: Laser Metrology and Nondestructive Testing (NDT)
<http://www.wpi.edu/~cfurlong/ME-593N>
DATE: 01 November 2000
DUE: 08 November 2000

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NOTE: In all solutions, state explicitly every assumption and/or approximation made, explain every procedure, and justify its use. Dimensional analyses are absolutely necessary. All results must be expressed in appropriate units. PLEASE, ALWAYS SHOW ALL WORK, while writing your results only on one side of the sheet(s) of paper; start each problem on a new sheet. *Attach this sheet to your solution. Show your work using a clear and professional style.*

PROBLEM 8.1. Write a computer program capable of reading, writing, and displaying 8-bit (PGM, or TIFF, or BMP) images. Your program should run under the MS Windows environment. This program should be implemented as part of the program that you previously developed to operate with 16/32-bit RTI images.

Utilize a high level programming language to develop your application (Visual Basic or C++ are recommended). Along with your results, please provide hard and soft copies of your software (as well as any compilation and linking instructions).

PROBLEM 8.2. Answer the discussion questions located in the last section of today's handout "Spatial resolution on a CCD camera."

READING 7.1. Chapter 7 (handout) from: C. Furlong, *Hybrid, experimental and computational, approach for the efficient study and optimization of mechanical and electro-mechanical components*, Center for Holographic Studies and Laser micro-mechaTronics, Worcester Polytechnic Institute, Mechanical Engineering Department, Worcester, MA, 1999.

READING 7.2. A. K. Jain and C. R. Christensen, "Digital processing of images in speckle noise," *Proc. SPIE, Applications of speckle phenomena*, **243**:46-50, 1980.

READING 7.3. T. Kreis, "Digital holographic interference-phase measurement using the Fourier-transform method," *J. Opt. Soc. Am. A.*, **3**(6):847-855, 1986.

READING 7.4. K. Itoh, "Analysis of the phase unwrapping algorithm," *Applied Optics*, **21**(14):2470, 1982.
